

REVISION OF AMERICAN *THAUMATOGRAPHA*, WITH A
NEW SPECIES FROM CUBA
(LEPIDOPTERA: TORTRICIDAE: CHLIDANOTINAE)

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Hilarographa and several related genera, primarily of pantropical distribution, until recently were included in the Glyphipterigidae as formed by Meyrick (1914), an assemblage now comprising several families. During revisionary studies on North American Glyphipterigidae and Choreutidae, it was determined that the three North American species of *Hilarographa* belong in the family Tortricidae. Since these species will be excluded from forthcoming revisions of the glyphipterigids and choreutids (Heppner, in prep. a, in prep. b), they are treated here. *Hilarographa*, *Thaumatographa*, and related genera were in part transferred to the Tortricidae by Diakonoff (1977a) and by Heppner (1978). The tribe Hilarographini was described for *Hilarographa* and *Mictopsichia* (Diakonoff, 1977a). It is one of four tribes in the Chlidanotinae, along with Polyorthini, Chlidanotini, and Schoenotenini.

The Hilarographini superficially appear like some Choreutidae, primarily because of bright coloration often enhanced by metallic-iridescent markings. However, they do not possess characters amenable to the family Choreutidae. The lack of a basally scaled haustellum is the most obvious character excluding them from Choreutidae. The note by Diakonoff (1977a), and again in Diakonoff (1977b), that *Hilarographa* and relatives possess a scaled haustellum, is erroneous: the "scales" referred to are actually elongated sensory setae, not true scales. Relationships to other Chlidanotinae among genera in Hilarographini are remarkable, in particular the slit valvae of some species in which valval pouches serve as repositories for corematal hairs. This apomorphic character is otherwise only recorded for the Polyorthini, in fact, this was originally a main character for the proposal of this tribe. Additional apomorphic characters among Hilarographini are an accessory bursa and asteroid-like signum in most females, which are characteristic of typical Chlidanotini. Recently evidence from larval characters has demonstrated that the Chlidanotinae may again warrant elevation to family status in the Tortricoidea (Diakonoff and Arita, 1981). The larva and pupa of *Thaumatographa eremnotorna* Diakonoff and Arita, a Japanese species, have provided the first immature stages for study for all the Chlidanotinae. The

larva of this *Thaumatographa* shows a bisetose pre-spiracular setal group on the prothorax, an arrangement thus far not known among Tortricidae where all larvae known are trisetose for this setal group. Larvae of other Chlidanotinae are unknown.

Presently the tribe Hilarographini contains 9 genera worldwide: *Charitographa*, *Embolostoma*, *Hilarographa*, *Idiothauma*, *Irianassa*, *Mictocommosis*, *Mictopsichia*, *Nexosa*, and *Thaumatographa*. The tribe will be reviewed on a world basis together with a species checklist in a forthcoming paper (Heppner, 1982). Little is known of the biologies of these moths. Tropical *Hilarographa* are day-fliers and most other Hilarographini that are as colorful as these species probably are also diurnally active. North American *Thaumatographa* species may only be nocturnally active, however, since they have only been collected at lights. The larvae of only three species have been reared: *Thaumatographa eremnotorna*, *Thaumatographa leucopyrga* Meyrick from Java, and *Thaumatographa regalis* (Walsingham) from California. The larvae of *Thaumatographa eremnotorna* and *T. regalis* feed on the cambium layer in the trunks of pines, while the larva of *T. leucopyrga* has been reared from the shoots of *Ardisia sieboldi* Miquel (Myrsinaceae).

Thaumatographa Walsingham, 1897:52

Type-species.—*Hilarographa zapyra* Meyrick, 1886 (Type locality: New Guinea), by original designation.

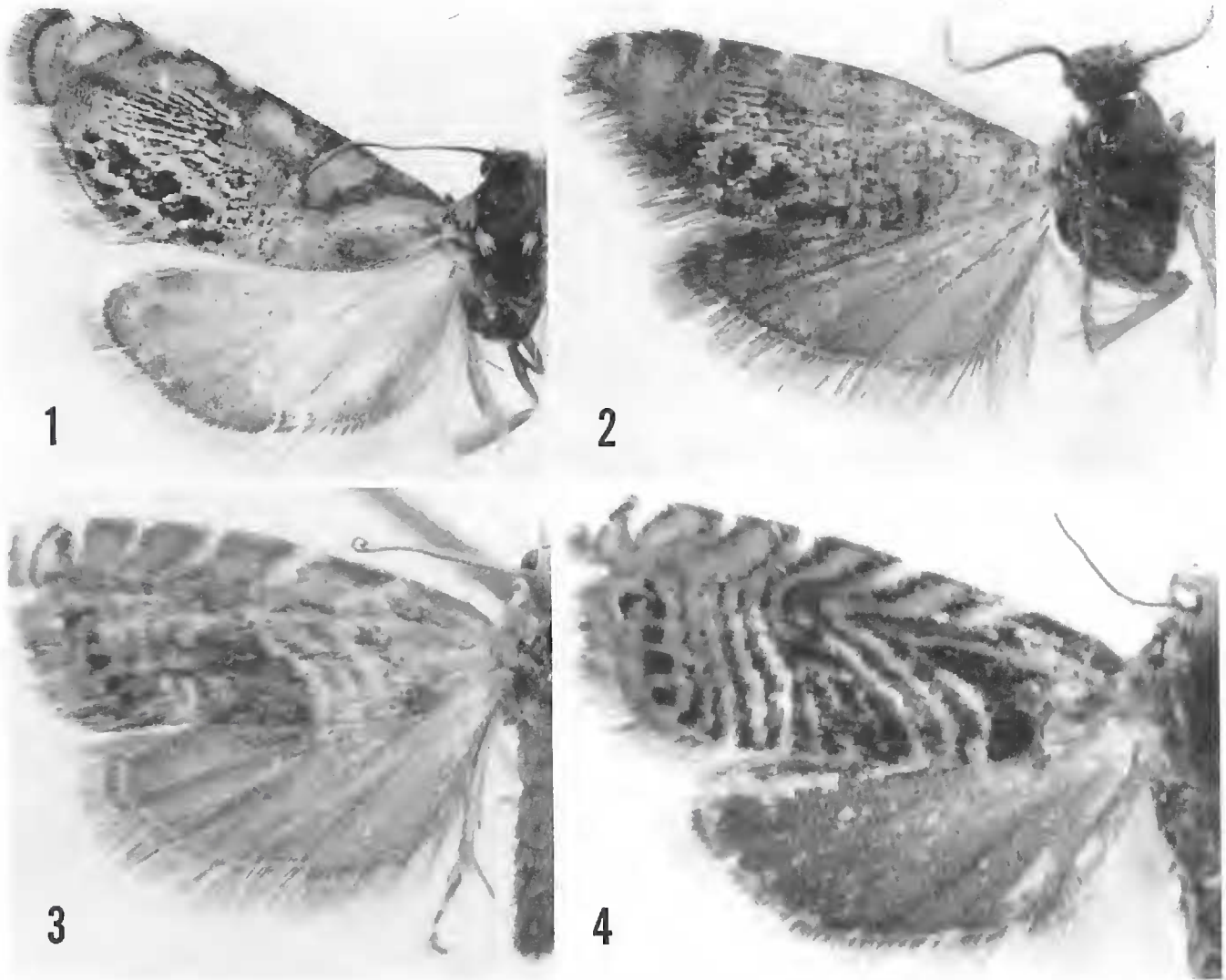
This genus comprises 32 species, including the new species described here. Most are known from the Indo-Australian region, with a few occurring in Japan. Only three species are known from North America, all closely related to Japanese species, and only the new Cuban species penetrates the Neotropical region. *Hilarographa*, contrarily, is exclusively Neotropical as far as is known.

Thaumatographa regalis (Walsingham), **New Combination**

Glyphipteryx regalis Walsingham, 1881:320.

This western North American species is very similar to the Japanese species *Thaumatographa decoris* (Diakonoff and Arita), differing in having larger silver spots between the black tornal spots of the forewings and having more orange bordering this row of spots.

Forewing length 7.8–10.0 mm. *Head*: fuscous mixed with tan on frons; labial palpus rather smooth scaled with white and brown scales on exterior side of basal segment; antenna short with long ventral setae in male. *Thorax*: fuscous with orange spots on posterior corners of mesothorax; patagia lustrous gray-brown; legs whitish with fuscous basally and orange on tarsal segments. *Forewing*: as in Figure 1, with ground color orange below fuscous costal margin; silver striae at base to fascia continuing to dorsal margin;



Figs. 1–4. Fig. 1. *Thaumatogetra regalis* (Walsingham), ♂, Kernville, California (UCB). Fig. 2. *T. cubensis* Heppner, ♂ holotype, La Casimba, Cuba (BMNH). Fig. 3. *T. youngiella* (Busck), ♂, Victoria, Vancouver Island, British Columbia, Canada (USNM). Fig. 4. *T. jonesi* (Brower), ♀ allotype, Martha's Vineyard, Massachusetts (USNM).

silver fascia at $\frac{1}{3}$ from base and oblique fascia from costal white mark near apex; three white costal marks following silver fascia at $\frac{1}{3}$, each with silver mesad; large buff-white field on distal half of wing, with numerous black striae and dots; tornal margin with 4 black spots bordered mesally by orange line and interrupted by silver spots; fringe fuscous; ventral side dull fuscous with white apical marks repeated. *Hindwing*: fuscous with central lighter area; fringe white and fuscous; ventral side mostly white. *Abdomen*: fuscous with pale scales on posterior margin of each segment. *Male genitalia*: as in Figure 6, with oblong setaceous valva having apex blunt and rounded along ventral margin; without dorsal corematal slit; tegumen and vinculum fused as sclerotized ring; saccus a short point; uncus elongate with slightly bulbous and setaceous distal end; hamus long and pointed; socius small setaceous stub; gnathos a small round band; transtilla a broad, relatively unsclerotized flap; anellus horseshoe-shaped with tapered distal ends; aedeagus (Fig. 7)

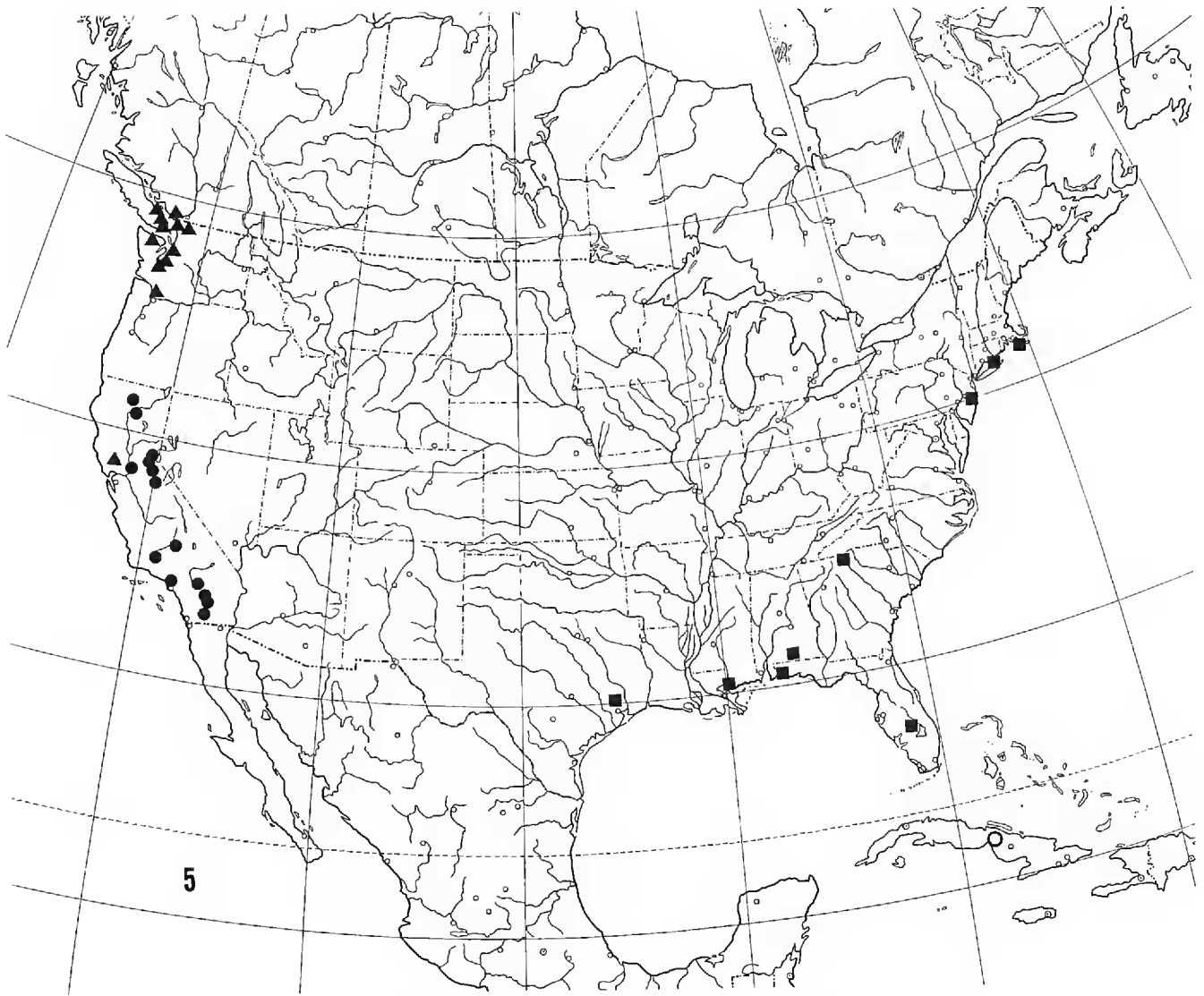
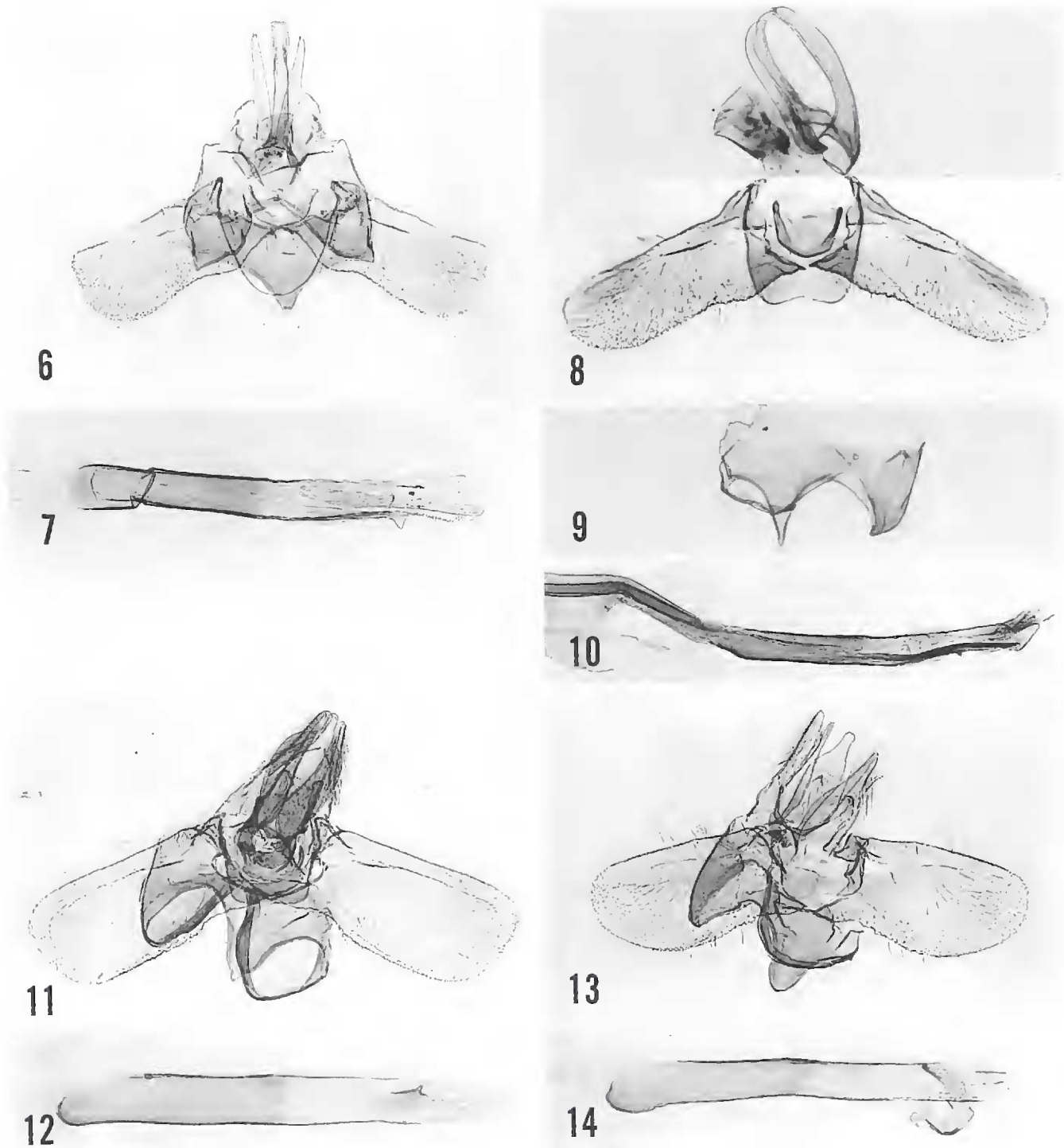


Fig. 5. Distribution map of *Thaumato-grapha* species in North America: *T. cubensis* Heppner (open circle), *T. jonesi* (Brower) (closed squares), *T. regalis* (Walsingham) (closed circles), and *T. youngiella* (Busck) (triangles).

elongate with cornutus having a small spine; vesica with elongated hood. *Female genitalia*: as in Figure 15, with ovipositor flattened; apophyses stout; ostium a large funnel; ductus bursae long and straight to curved area near bursa, little sclerotized; corpus bursae ovate with small accessory bursa on long duct; signum (Fig. 16) a small asteroid-like mass of spines.

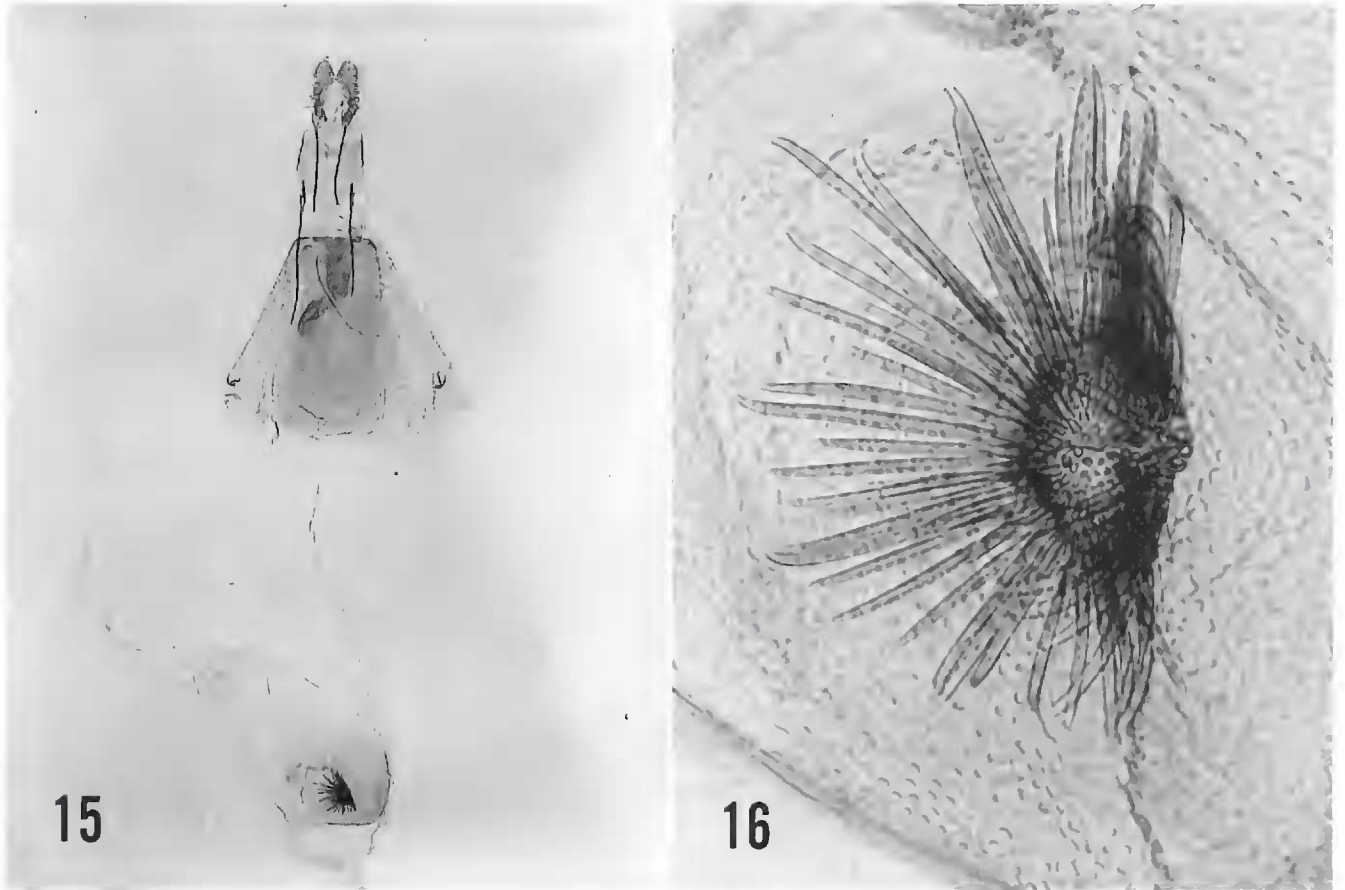
Types.—Holotype ♀: Mt. Shasta [Siskiyou Co.], CALIFORNIA, 2 Aug–1 Sep 1871, Walsingham (BMNH, Walsingham Coll. 92037).

Specimens studied.—19 ♂, 7 ♀. CALIFORNIA: *Calaveras Co.*: 4 mi. E Murphy's, 3000 ft., 17 Jul 1963 (1 ♂), 2 Jul 1963 (1 ♂), P. Quyle (UCB). *El Dorado Co.*: 2 mi. W Lk. Edson, 27 May 1972 (1 ♀), J. Doyen (UCB). *Kern Co.*: Kernville, 28 Apr 1964 (6 ♂), J. A. Powell (UCB); Mt. Pinos, 6800 ft., 2 Jul 1965 (1 ♂), D. J. Calvert (UCB); Wofford Hts., Lk. Isabella, 2700 ft., 14 May 1976 (2 ♂), R. J. Ford (LACM). *Los Angeles Co.*: Los Angeles, 13 May 1931 (1 ♂), Wolff (LACM). *Placer Co.*: Carnelian Bay, Lk. Tahoe, 24



Figs. 6–14. Male genitalia of North American *Thaumatogetra* species. Fig. 6. *T. regalis* (Walsingham), Kernville, California (JBH 504) (UCB). Fig. 7. Same, detail of aedeagus. Fig. 8. *T. cubensis* Heppner [damaged], La Casimba, Cuba (BMNH 20267, holotype). Fig. 9. Same, detached vinculum. Fig. 10. Same, aedeagus detail. Fig. 11. *T. jonesi* (Brower), Open Pond Cpgd., Alabama (JBH 624) (JBH). Fig. 12. Same, aedeagus detail. Fig. 13. *T. youngiella* (Busck), Departure Bay, Vancouver Island, British Columbia, Canada (USNM 77128, paralectotype). Fig. 14. Same, aedeagus detail.

Jun 1964 (1 ♂), D. F. Veirs (UCB); "Placer Co.," 1 May 1919 (1 ♀), H. Vachell (USNM); Michigan Bluff, 21 Jun 1967 (1 ♀), R. P. Allen (CSDA). *Riverside Co.*: Idyllwild, 13 Jun 1940 (1 ♂), F. H. Rindge (AMNH); Santa Rosa Mtn., 7100 ft., 6–7 Jul 1974 (1 ♀), D. C. Frack (DCF). *Sacramento Co.*: Folsom,



Figs. 15, 16. Fig. 15. *Thaumatogeta regalis* (Walsingham), ♀ genitalia, Placer Co., California (USNM 77127). Fig. 16. Same, signum detail.

20 Jul 1885 (1 ♂), ex *Pinus sabiniana*, Koebele (BMNH); Folsom, 23 Jul 1885 (1 ♂) [Koebele] (USNM). *San Bernardino Co.*: Barton Flats [San Bernardino Mts.], 31 Jul 1971 (1 ♀), D. C. Frack (DCF); Big Bear Lk., 6800 ft. [San Bernardino Mts.], 7 Aug 1978 (1 ♂), R. H. Leuschner (RHL). *San Diego Co.*: Laguna, 18 Jun 1965 (1 ♀), ex *Pinus ponderosa*, K. Baker (CSDA). *Shasta Co.*: Hat Cr., 11 Jun 1960 (1 ♂), F. Stehr (CSDA). *Siskiyou Co.*: Shasta City, 22 Aug 1958 (1 ♂), J. A. Powell (UCB). *Tuolumne Co.*: Twain Harte, 4000 ft., 17 Jul 1964 (1 ♀), M. R. & S. H. Lundgren (CAS).

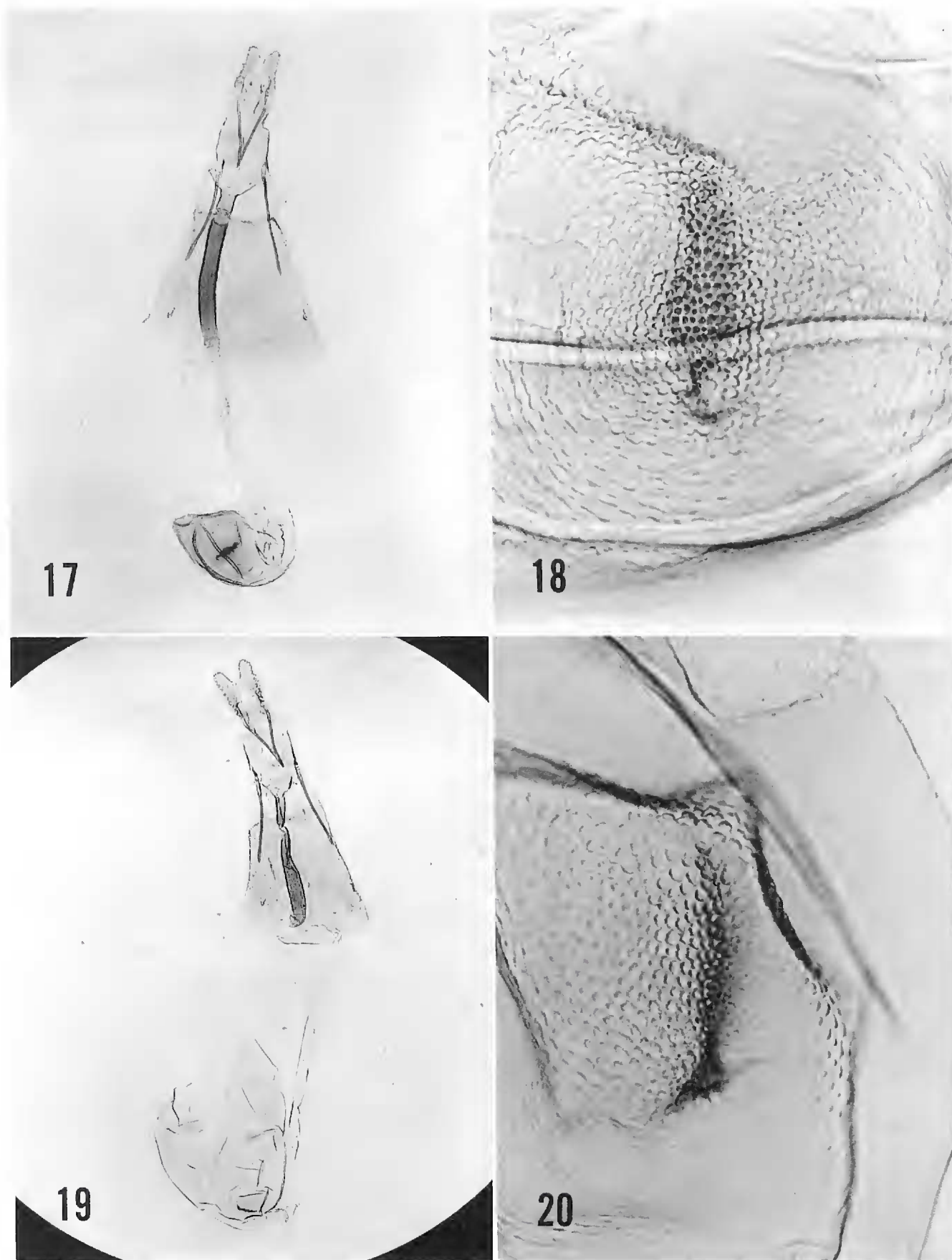
Hosts.—*Pinus ponderosa* Douglas and *Pinus sabiniana* Douglas (Pinaceae).

Distribution.—Known only from California.

Remarks.—This species is remarkably similar superficially to the Japanese species, *Thaumatogeta decoris*. The genitalia, however, will distinguish the two species. The Japanese species *T. eremnotorna*, a related species, has been reared from the cambium of *Pinus densiflora* Siebold & Zuccerini. Larvae of *T. regalis* also feed on the cambium layer of pines.

***Thaumatogeta cubensis*, Heppner, new species**

This species is superficially similar to *T. regalis*, although smaller, but differs in characters of the male genitalia and has less orange on the forewings.



Figs. 17–20. Female genitalia of *Thaumatogeta* species. Fig. 17. *T. youngiella* (Busck), Victoria, Vancouver Island, British Columbia, Canada (USNM 77177). Fig. 18. Same, signum detail. Fig. 19. *T. jonesi* (Brower), Martha's Vineyard, Massachusetts (JBH 501, paratype) (CPK). Fig. 20. Same, signum detail.

Forewing length 5.2 mm. *Head*: brown; labial palpus white, upturned with short tuft on 2nd segment. *Thorax*: fuscous; legs tan, with fuscous on femora and tarsal segments. *Forewing*: relatively pointed; termen oblique; maculation as in Figure 2, ground color fuscous; orange scales basally bordering pale silvery white fascia at $\frac{1}{3}$ from base and a conspicuous orange area on apical quarter; distal of pale silvery white fascia another 4 white marks on costal margin; white speckled area interspersed among black striae beyond mid-wing, with 4 black spots somewhat merged along tornal angle interspersed with silvery spots distally; distal two costal white marks also extended as silver lines; fringe fuscous; ventral side dull fuscous with white costal marks repeated. *Hindwing*: uniformly fuscous. *Abdomen*: fuscous with silvery scales at posterior margin of each segment. *Male genitalia*: as in Figures 8, 9 (damaged); valva elongate, setaceous, with rounded apex; tegumen and vinculum fused; saccus a sharp point; uncus elongated, with a thorn on tip ventrally and setaceous; hamus long, narrow and upcurved near distal end; socius $\frac{2}{3}$ hamus length, setaceous; gnathos a membranous spatulate structure, truncate apically; transtilla large, blunt rounded; anellus horse-shoe-shaped with a triangular-shaped base; aedeagus (Fig. 10) elongate with long cornutus having one spine; vesica with long hood. *Female genitalia*: unknown.

Types.—Holotype ♂: La Casimba [Camaguey], CUBA, 12 Dec 1969, ex *Pinus cubensis* (BMNH, slide no. 20267).

Distribution.—Known only from Cuba.

Host.—*Pinus cubensis* Grisebach (Pinaceae).

Remarks.—Like the Japanese *Thaumatographa decoris*, this species appears remarkably similar to *T. regalis*. The genitalia are very different and the wing maculation is different in details from the other two species.

Thaumatographa youngiella (Busck), New Combination

Hilarographa youngiella Busck, 1922:278.

Hilarographa olympica Braun, 1923:118.

This species is very similar in maculation to *Thaumatographa jonesi* (Brower) but lacks the distinct red-orange areas, having instead pale yellow or buff areas and a general dark brown appearance.

Forewing length 4.8–6.4 mm. *Head*: fuscous and buff, becoming white on frons; labial palpus smooth-scaled and white, with fuscous on basal segment; antenna short with long ventral setae in males. *Thorax*: fuscous; patagia lustrous gray fuscous; legs white with fuscous bands on tibiae and tarsal segments. *Forewing*: as in Figure 3; fuscous ground color, with 5 oblique costal white fascia and apical white spot; dorsal margin with 3 closely spaced oblique fascia at $\frac{1}{3}$ from base and another white fascia at $\frac{2}{3}$ from base; ends of all fascia silver metallic; yellow-buff areas interspersed between white

fascia, each with black borders; termen with 4 black spots toward tornus; mid-terminal margin with silver spot; fringe fuscous with subapical white spot; ventral side fuscous with costal white marks repeated. *Hindwing*: fuscous; fringe pale fuscous; ventral side dull fuscous with white apical border. *Abdomen*: fuscous with pale silvery scales on posterior of each segment. *Male genitalia*: as in Figure 13; oblong setaceous valva, with rounded apex and antero-dorsad slit for coremata setae; tegumen and vinculum fused as sclerotized ring; saccus shortly extended; uncus spatulate, with narrowed point; hamus long; socius equally long, flattened and setaceous; gnathos horseshoe-shaped, somewhat evenly thickened; transtilla quadrate with thickened posterior end; anellus horseshoe-shaped with slight ventral point; aedeagus (Fig. 14) elongate, with small cornutus; vesica with elongated hood. *Female genitalia*: as in Figure 17; ovipositor flattened; apophyses stout; ostium a simple cup; ductus bursae straight, posterior half sclerotized; corpus bursae moderate in size with small accessory bursa on moderately long duct; signum (Fig. 18) a small linear patch of scrobations.

Types.—Lectotype ♀ (*youngiella*): Biological Station, Departure Bay [Vancouver Island], BRITISH COLUMBIA, CANADA, 4 Aug 1908, C. H. Young (CNC No. 1129), hereby designated. Holotype ♀ (*olympica*): Olympic Hot Springs trail [Clallam Co.], Washington, 27 Jul 1922 [E. L. Braun] (ANSP).

Specimens studied.—(38 ♂, 10 ♀): Paralectotypes (3 ♂, 1 ♀): same locality as lectotype of *T. youngiella*, 2 Aug 1908 (1 ♂, USNM), 4 Aug 1908 (1 ♂, CNC; 1 ♂, USNM), 9 Aug 1908 (1 ♀, CNC), C. H. Young. CANADA.—BRITISH COLUMBIA: Duncan [Vancouver Island], 4 Aug 1920 (2 ♂), 9 Aug 1933 (4 ♂), W. Downes (CNC); Fraser Mills, 30 Jun 1923 (1 ♂), 25 Jul 1922 (1 ♂), L. E. Marmont (USNM); Victoria [Vancouver Island], 2 Jul 1922 (1 ♂), 10 Jul 1923 (1 ♂), 15 Jul 1923 (1 ♂), 7 Aug 1922 (3 ♂), 10 Aug 1922 (1 ♀), W. R. Carter (USNM); Victoria, 31 Jul 1920 (1 ♀), W. Downes (CNC); Victoria, 12 Jul 1923 (1 ♂, 2 ♀, ANSP), 14 Jul 1923 (1 ♂, ANSP; 9 ♂, USNM), 4 Aug 1923 (1 ♀, USNM), W. H. Blackmore. USA.—CALIFORNIA: *Lake Co.*: 1 mi. NW Cobb, 31 May–27 Jun 1979 (1 ♂), Powell and De Benedictis (UCB). WASHINGTON: *Clark Co.*: Vancouver, 22 Aug 1930 (1 ♂, 1 ♀), J. F. G. Clarke (USNM). *King Co.*: Seattle, 29 Jul 1963 (2 ♂), T. Kincaid (UCB). *Pierce Co.*: Puyallup, 20 Aug 1930 (1 ♂, 1 ♀), T. C. Clarke (USNM); South Tacoma, 20 Aug 1930 (1 ♀), J. F. G. Clarke (USNM). *Thurston Co.*: Lk. St. Clair, 21 Aug 1930 (1 ♂), T. C. Clarke (USNM). *Whatcom Co.*: Bellingham, 19 Aug 1962 (1 ♂, 1 ♀), J. F. G. Clarke (USNM); Squalicum Lk., 14 Aug 1930 (1 ♂), J. F. G. Clarke (USNM), and 14 Aug 1930 (1 ♂), T. C. Clarke (USNM).

Distribution.—Southern British Columbia to northern California.

Host.—Unknown.

Remarks.—This species and the following species, *Thaumatographa jonesi* (Brower), are related yet quite different in appearance and in genital char-

acters from *T. regalis* and *T. cubensis*. The Japanese species *Thaumatographa aurosa* (Diakonoff & Arita) is very similar in forewing pattern to *T. youngiella* but is distinguished by the genitalia.

Thaumatographa jonesi (Brower), **New Combination**

Hilarographa jonesi Brower, 1953:96.

Superficially this species from the eastern United States is similar to *T. youngiella* but differs in having much more red-orange on the forewings.

Forewing length 5.9–6.9 mm. *Head*: fuscous with central frons having white line and white along lateral borders of frons; labial palpus white, smooth-scaled with fuscous basal segment and some brown apically; antenna short with long ventral setae in males. *Thorax*: fuscous; patagia fuscous with some buff-white anteriorly; legs white with fuscous bands, especially on tarsal segments. *Forewing*: as in Figure 4; ground color fuscous between numerous oblique fascia; an orange mid-wing stria from base to $\frac{1}{3}$ of wing; along costal margin striae and marks begin with white and alternate with red-orange, each bordered by black, with apical two orange fascia extending to tornal angle; apical white fascia extended as silver; along anal margin first 3 white fascia, then a yellow-orange fascia, then orange alternated with white until tornus; termen with 5 black spots to tornus; silver mid-termen mark; fringe fuscous except for subapical white spot on termen; ventral side fuscous with white costal marks repeated. *Hindwing*: fuscous with pale white and fuscous fringe; ventral side fuscous with subterminal and apical white border. *Abdomen*: fuscous with pale silvery scales on posterior of each segment. *Male genitalia*: as in Figure 11, with oblong setaceous valva antero-dorsally slit for coremata setae insertion; tegumen and vinculum as fused and sclerotized ring, with extended saccus; uncus spatulate with short knob on tip; hamus long; socius equally long, flattened and setaceous; gnathos horseshoe-shaped, with divergent pointed base ends; transtilla quadrate with thickened posterior end; anellus horseshoe-shaped; aedeagus (Fig. 12) elongate with thorn-like cornutus; vesica with elongated hood. *Female genitalia*: as in Figure 19; flattened ovipositor; apophyses stout; ostium a simple cup; ductus bursae straight, posterior half sclerotized; corpus bursae large, ovate with small accessory bursa on moderately long duct; signum (Fig. 20) a small linear patch of scrobations.

Types. — Holotype ♂: Martha's Vineyard, Dukes Co., MASSACHUSETTS, 6 Aug 1941, F. M. Jones (AEB). Paratypes (4 ♀): same locality as holotype, 18 Jul 1947 (1 ♀), F. M. Jones (CPK), 6 Aug 1943 (1 ♀), F. M. Jones (USNM). *New Jersey*. — Lakehurst [Ocean Co.], 4 Jul 1909 (1 ♀), W. D. Kearfott (USNM). *New York*. — Orient [Suffolk Co.], Long Island, 2 Sep 1948 (1 ♀), R. Latham (AMNH).

Additional specimens (5 ♂, 1 ♀; 2). — *Alabama*. — Covington Co.: Open Pond

Cpgd., 20 mi. S Andalusia, 18 Apr 1976 (1 ♂), J. B. Heppner (JBH). *Florida*.—Escambia Co.: Pensacola, 28 Sep 1961 (1), S. M. Hills (SMH). Highlands Co.: Archbold Biol. Sta., 24 Nov 1971 (1), S. A. Frost (FSCA). *Louisiana*.—St. Tammany Pa.: Slidell, 20 Sep 1974 (1 ♂), V. A. Brou (VAB). *South Carolina*.—Oconee Co.: Cherry Hill Rec. Area, 2000 ft., 5 Sep 1958 (1 ♂), 7 Sep 1958 (1 ♂, 1 ♀), J. G. Franclemont (USNM). *Texas*.—Montgomery Co.: Conroe, Camp Strake, 14 Sep 1977 (1 ♂), E. C. Knudson (FSCA).

Distribution.—Eastern coastal United States from Massachusetts to Texas.

Host.—Unknown.

Remarks.—This species has a forewing pattern similar to *T. youngiella* but is more red-orange as opposed to the fuscous color of *T. youngiella*. The larva of this species probably feeds on several species of pine in the coastal areas and into the piedmont of the eastern United States.

Acknowledgments

Specimens were studied from the following institutions and private collections: A. E. Brower, Augusta, Maine (AEB); American Museum of Natural History, New York (AMNH); British Museum (Natural History), London (BMNH); Vernon A. Brou, Edgard, Louisiana (VAB); California Academy of Sciences, San Francisco (CAS); California State Department of Agriculture, Sacramento (CSDA); Canadian National Collection, Ottawa (CNC); Florida State Collection of Arthropods, Gainesville (FSCA); D. C. Frack, Los Angeles, California (DCF); S. M. Hills, North Carolina (SMH); J. B. Heppner, Washington, D. C. (JBH); C. P. Kimball, West Barnstable, Massachusetts (CPK); R. H. Leuschner, Manhattan Beach, California (RHL); Los Angeles County Museum of Natural History, Los Angeles (LACM); United States National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM); and the University of California, Berkeley (UCB). I wish to thank my colleagues at the Smithsonian Institution, J. F. G. Clarke and D. R. Davis, for their comments on the manuscript.

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